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IV. *A Letter from Dr. Archibald Adams to Dr. Hans Sloane, R. S. Secr. concerning the Manner of making Microscopes, &c.*

Norwich, August 11. 1709.

S I R,

Pursuant to what I wrote some time ago concerning Microscopes, I think that all the Microscopes which preceded Mr. *Leenwenhoek's*, are so much out-done by his, that it will be proper for me only to take Notice of these and the rest of later Invention, not designing to lessen their Usefulness, but only to add a few Thoughts which may be of Service.

I had not an opportunity of examining Mr. *Leenwenhoek's* Glasses particularly, which is a Favour he allows to none; therefore I am not capable at this distance to describe either their Make or Use, any further than that to me they appear'd to be Spherules lodg'd between two Plates of Gold or Brass, in a hole whose Diameter might not be bigger than that of a small Pins head, and the Objects I saw through them were pretty and diverting; but still their Make and Truth are unknown.

Mr. *Butterfield* is very Curious in melting his Glass, but I suppose unsuccessful in casting his Spheres; for besides that a sufficient quantity of beaten Glass cannot stick to the moistned Point of a fine Needle; so neither can it run equally, hold the Needle how you will, nor the Globule when run stick to the Needle, but must unavoidably drop; and wheresoever it happens to fall, it must in that almost liquid State receive Impressions sufficient to spoil the Figure of a Sphere.

Mr.

Mr. Gray has shown the defect of his Method, which he us'd to recover by grinding and polishing his Glasses on a Brass Plane, and so reduce 'em to Hemispherules; but how far short polish'd Glasses (I speak of small ones) come of those which are cast, I leave to any one to judge who has seen both. His Water and Quicksilver Microscopes I never saw, so can say little to them.

After what manner Mr. *Wilson's* Glasses are made I know not, but sure his greatest Magnifiers are ill plac'd, they being sunk to so great a distance from the Eye, the Object cannot appear to that Advantage it otherwise would; if therefore instead of a hollow Cap he would contrive a plain Plate of any Metal for the Reception of the Glass, then the Eye and the Object might come to their due distance; neither ought there to be any Calx or Glass between the Object and the Spherule, when we use the greatest Magnifiers, because if the *Focus* of a Sphere be upon the extremity of its Circumference, any small distance from that must spoil the truth of the Objects appearance.

I cannot say, that the Glasses I have made are without fault, but I think they magnify more than any I have yet seen; and were they plac'd to the best advantage, they would Magnify much more than they do: They are made thus.

I take a piece of fine Window Glass, and I rase it with a Diamond into as many lengths as I think needful, not exceeding an eighth of an Inch in breadth; then holding one of these lengths between the Fore-Finger and Thumb of each Hand, over a very fine Flame, until the Glass begin to soften, I draw it out till it be as fine as a Hair and break: Then Inuring each of the Ends into the purest part of the Flame, I have two Spheres presently, which I can make larger or less as I please; if they stay long in the Flame, they'll have spots, so I draw 'em out presently after they

they turn round. As for the Stem, I break it off as near the Ball as I can, and lodging the remainder of this Stem between the Plates, and by drilling the Hole exactly round, all this Protuberance is bury'd between the Plates, and the Microscope performs to Admiration; insomuch, that the same Thread of very fine Muslin appeared 3 or 4 times bigger in one of these, than it did in the first or second of *Mr. Wilson's*. I thought I saw Animals in fine Old Brandy, but they were so nimble in their Motion, that I can give no particular Description of them. Human Blood is so far from showing any Red *Globules* swimming in *Serum*, that immediately after its Emission it appears to be a Body of infinite Branches, running in no certain Order, variously colour'd; where it lies thickest on the Glass, its of a dull Red, where thin, inclining to Yellow; but the whole so blended as to represent very near the top of a Yew-tree in a very fine Landskip, having its supposed Branches of a red and yellow confusedly intermixt. But not satisfy'd with this appearance, tho' the same as to quality in Eleven different Glasses, and as many different sorts of Blood, I resolv'd to view it another way, which was, by diluting one third of thick in the *Serum* of Blood; and laying it upon my Glass, I could see the red Branches as before, and the transparent fill'd with Particles of great variety of Figures, which I took to be the Salts of the Blood, but fewest Globular, and they were pellucid.

If the Fluids moving in an Evanescent Artery appear Globular, I suppose its because the Canal is round, which alters the case much.

I had

I had at the same time an opportunity of seeing some Pleuritick Blood; and thought, that its Branches spread in a different Method from the sound, and more strongly perplex'd with overthwart Branches, which appeared black, like Blood that had stood two or three Days. Whether the Attraction of Particles arising from this difference of Figure, may not render the Blood incapable of passing through the Capillary Arteries of the *Pleura* in that case, I'll leave it to my Betters to judge; I should think, that since the Propellent force of the Heart is least at the Capillary Arteries, then there the attractive force of the Particles of the Blood should be greatest; and since Spherical Bodies are the most attractive of any, respect being had to their Solidities, were the Blood so plentifully stock'd with Globules, as some say, we should never be free from Obstructions, the Natural Consequence of this attractive force. If my Glasses have deceived me, and this that I have written be found to be a mistake, no Man shall be more ready to retract and acknowledge it than,

Sir,

Your assured humble

and obliged Servant,

Archibald Adams.